

# Black Color Morph of the Brown Lemming, *Lemmus trimucronatus* = *L. sibiricus*

DENVER W. HOLT<sup>1</sup>, MICHAEL T. MAPLES<sup>1</sup>, AND CHRIS SAVOK<sup>2</sup>

<sup>1</sup>Owl Research Institute, P.O. Box 39, Charlo, Montana 59824 USA; E-mail: owlmontana@charlo.net

<sup>2</sup>P.O. Box 2097 Barrow, Alaska 99723 USA

Holt, Denver W., Michael T. Maples, and Chris Savok. 2003. "Black" color morph of the Brown Lemming, *Lemmus trimucronatus* = *L. sibiricus*. *Canadian Field-Naturalist* 117 (3): 466-468.

A black pelage Brown Lemming is reported from Barrow, Alaska. The occurrence of this black color morph appears to be rare. During twelve years of Snowy Owl research and lemming trapping, only one has been seen. Of 554 snap-trapped Brown Lemmings and 1649 Brown Lemmings found cached at owl nests, no black individuals were found. The pelage of the black morph is described using a Munsell Soil Color Chart.

Key Words: Brown Lemming, *Lemmus trimucronatus* = *L. sibiricus*, melanism, black morph, Alaska

Pelage coloration in lemmings can be more variable than other species of arvicoline rodents, particularly *Lemmus* and *Dicrostonyx* (Stenseth and Ims 1993). Pelage coloration in the Brown Lemming (*Lemmus trimucronatus* = *L. sibiricus*) can range through many phases from juvenile to adult growth, and can vary seasonally after subsequent molts. Basically, however, the overall color is brown with various intensities of yellow, red and black (Bee and Hall 1956). These colors likely reflect differences in the width and color of the subapical bands on individual hairs, similar to *Microtus* (see Gaines 1985). Polymorphism has not been reported for the Brown Lemming; however, albino and melanistic individuals are known (Bee and Hall 1956). Unfortunately, little accompanying information has been provided in the primary literature regarding these aberrant phenotypes (Bee and Hall 1956; Rausch and Rausch 1974; Stenseth and Ims 1993). The purpose of this paper is to describe the pelage coloration of a single "black" Brown Lemming using a standardized method, and to report the frequency of occurrence of this phenotype, relative to normally colored Brown Lemmings encountered in our study.

## Study Area and Methods

DWH has studied Snowy Owls (*Nyctea scandiaca*) at Barrow, Alaska (71° 18' N, 156° 40' W) since 1992. During the course of study, researchers have snap-trapped small mammals (1992-2003), recorded prey cached at Snowy Owl nests (1993, 1995, 1996, 1999, 2000, 2002, 2003) and collected Snowy Owl pellets (1992-2003). Because owls have weak digestive en-

zymes (low acidity) (Duke et al. 1976), the regurgitated bone, hair, feathers and teeth of prey are reliable indicators of species eaten (Marti 1987; Holt et al. 1987). The color of pellets also reflects the pelage or plumage color of prey (Holt 1990). For example, blond colored pellets regurgitated by Short-eared Owls (*Asio flammeus*) were representative of "blond" morph Meadow Voles (*Microtus pennsylvanicus*) (Holt 1990).

Colors of small mammals are sometimes described using standardized color charts such as the Munsell Soil Color Chart system (see Holt 1990). These charts may be useful because they allow researchers to make standardized color comparisons over wide geographic areas. In this note, we used the Munsell Soil Color Chart (Munsell 2000) to score an aberrantly colored Brown Lemming.

## Results

On 18 July 1995 MTM and CS observed a black Brown Lemming on the tundra, 1 km west of the airport at Barrow, Alaska (71° 16' N, 156° 44' W), while monitoring a Snowy Owl nest. The lemming was collected, photographed, described, weighed, sexed, reproductive status determined, and prepared as a study skin by MTM. The specimen was placed in the local Iliisaġvik College Natural History Museum, Barrow, Alaska. Currently, it has not been given an accession number. The lemming was entirely black dorsally, with few dark brown hairs on the tail tip (Figure 1). The dorsal and ventral colors were scored from the Munsell Soil Color Chart 1 (i.e., GLEY 1). Its Munsell color score was N 2.5/ and described as "black" dorsally, and N 3/ "very dark gray" ventrally. The speci-



FIGURE 1. Comparison of the "black" (right) and typically colored Brown Lemming.

men was a 101 g female with 3 and 4 embryos in the right and left uterine horns, respectively.

During the twelve years of study, researchers have snap-trapped 554 Brown Lemmings and counted 1649 Brown Lemmings cached at Snowy Owl nests. Of these 2203 Brown Lemmings, none were black. Researchers have also recorded the remains of over 31000 Brown Lemmings from about 8500 Snowy Owl pellets, and have not detected any pellets composed of black fur, although some could have been overlooked. Furthermore, during these twelve years of study, 19 owl researchers have hiked the tundra within our 213 km<sup>2</sup> study area almost daily from mid-June to 01 September, logging hundred of kilometres individually and annually – and yet, this is the only observation of a black Brown Lemming.

## Discussion

The occurrence of black Brown Lemmings has generally been reported in the literature; however, specific details concerning numbers, location and relative frequency of occurrence are lacking (Bee and Hall 1956; Rausch and Rausch 1974; R. Rausch, personal communication). Rausch and Rausch (1974) mentioned that "a small proportion of melanistic brown lemmings were present in the vicinity of Barrow in 1953", but

gave no details. A few of these "melanistic" individuals were captured alive and later bred in captivity at the Arctic Health Research Center in Fairbanks (AHRC), (R. L. Rausch, personal communication). This breeding colony was maintained from 1954 to 1958 when it was "lost", then restarted in 1959, once again with Brown Lemmings from Barrow, and continued to 1974 (Rausch and Rausch 1974). Other captive Brown Lemming colonies also existed at this time in Barrow and Anchorage, Alaska (Thompson 1955a; Thompson 1955b; R. L. Rausch, personal communication). Rausch and Rausch (1974) determined that a recessive gene was responsible for the melanistic color morph.

Because specific information regarding black morph Brown Lemmings was not provided in the primary literature, we checked the vertebrate collection at the University of Alaska Museum, Fairbanks, to determine if black Brown Lemmings had been recorded from Barrow. Surprisingly, 12 specimens existed: 5 males and 7 females. All were reported to have come from or were thought to have come from Barrow, between 1959 and 1964. All specimen labels indicated the lemmings were collected by Harry K. Brower or Otto W. Geist.

The specimen labels indicated that seven of these were captives from Barrow, two others were found in Barrow but with no specific data, two more are not known if found in Barrow, and only one was reported to have come from the tundra near Barrow. No other details were provided. Thus, given the high proportion of melanistic individuals in such a short time period (1959 to 1964) and the fact that little or no field data exist on the specimen tags, it is conceivable that most of these 12 individuals were bred in captivity (R. Rausch, personal communication). This confusion reiterates the need for recording specific details of aberrant individuals. No other museums were checked.

Several studies have examined the role of pelage color variation in small mammals and most conclude that predation may be the selective force driving pelage color (crypsis), which tends to match the background of the habitats occupied (Belk and Smith 1996; Krupa and Geluso 2000). Cryptic and aposematic coloration however, may both act in the Norwegian Lemming (*Lemmus lemmus*) (Taitt 1993). Whether this black phenotype exerts any selective advantage or disadvantage or is just an aberrant mutation is currently unknown. However, we reasonably conclude the black color morph is exceedingly rare.

Aberrant color morphs should be reported however, their color variation should be described in a standard and replicable manner (i.e., color charts). These standards should then reduce confusion when describing new color morphs. Furthermore, exact locality and detailed notes of aberrant morphs should be taken to help determine distribution and if the morph is localized or not.

## Acknowledgments

Robert Rausch provided helpful comments on drafts of the manuscript. Gorden Jarrell provided museum data. Mark Korti, Amie Stevens, Lara Dehn helped in many ways in the field and lab. Daniel J. Cox, Natural Exposures, Bozeman, Montana, took the photo. We thank them all.

## Literature Cited

- Bee, J. W., and E. R. Hall.** 1956. Mammals of Northern Alaska. Miscellaneous Publication (8): 1-309, University of Kansas Museum of Natural History, Lawrence, Kansas.
- Belk, M. C., and M. H. Smith.** 1996. Pelage coloration in Oldfield Mice (*Peromyscus polionotus*): antipredator adaptation. *Journal of Mammalogy* 77: 882-890.
- Duke, G. E., O. A. Evanson, and A. Jegers.** 1976. Meal to pellet intervals in 14 species of captive raptors. *Comparative Biochemistry and Physiology* 53: 1-6.
- Gaines, M. S.** 1985. Genetics. Pages 845-883 in *Biology of New World Microtus*. Edited by R. H. Tamarin. Special Publication (8): 1-893, American Society of Mammalogists.
- Holt, D.W.** 1990. "Blond" color morph of Meadow Voles, *Microtus pennsylvanicus*, from Massachusetts. *Canadian Field-Naturalist* 104: 596-597.
- Holt, D. W., L. J. Lyons, and R. Hale.** 1987. Techniques for differentiating the pellets of Short-eared Owls and Northern Harriers. *Condor* 89: 929-931.
- Krupa, J. J., and K. N. Geluso.** 2000. Matching the color of excavated soil: cryptic coloration in the Plains Pocket Gopher (*Geomys bursarius*). *Journal of Mammalogy* 81: 86-96.
- Marti, C. D.** 1987. Raptor food habits studies. Pages 67-80 in *Raptor Management Techniques Manual*. Edited by B. A. Giron-Pendleton, B. A. Millsap, K. W. Kline and D. M. Bird. Technical Series (10). National Wildlife Federation, Washington, D.C.
- Munsell Soil Color Charts.** 2000. Gregtag/MacBeth, New York.
- Rausch, R. L., and V. R. Rausch.** 1974. Taxonomy and zoogeography of *Lemmus* spp. (Rodentia: Arvicolinae), with notes on laboratory-reared lemmings. *Zeitschrift für Säugetierkunde* 40: 8-34.
- Stenseth, N. C., and R. A. Ims.** 1993. The evolutionary history and distribution of lemmings – an introduction. Pages 37-43 in *The Biology of Lemmings*. Edited by N. C. Stenseth and R. A. Ims. Academic Press, London.
- Taitt, M. J.** 1993. Adaptive coloration in *Lemmus lemmus*: Why aren't Norwegian Lemmings brown? Pages 439-445 in *The Biology of Lemmings*. Edited by N. C. Stenseth and R. A. Ims. Academic Press, London.
- Thompson, D. Q.** 1955a. The ecology and population dynamics of the Brown Lemming (*Lemmus trimucronatus*) at Point Barrow, Alaska. Unpublished Ph.D. Dissertation, University of Missouri, Columbia. 138 pages.
- Thompson, D. Q.** 1955b. The 1953 lemming emigration at Point Barrow, Alaska. *Arctic* 8: 37-45.

Received 6 March 2001

Accepted 9 February 2004

## White Color Phase of the Swift Fox, *Vulpes velox*

JAN F. KAMLER<sup>1</sup> and WARREN B. BALLARD

Department of Range, Wildlife, and Fisheries Management, Box 42125, Texas Tech University, Lubbock, Texas 79409 USA

<sup>1</sup>Present address: Polish Academy of Sciences, Mammal Research Institute, 17-230 Białowieża, Poland

Kamler, Jan F., and Warren B. Ballard. 2003. White color phase of the Swift Fox, *Vulpes velox*. *Canadian Field-Naturalist* 117(3): 468-469.

While live-trapping Swift Foxes (*Vulpes velox*) in northwestern Texas, we captured and radio-collared a Swift Fox that exhibited a white pelage and light blue eyes. Although white color phases and light blue eyes have been reported for other canid species, this is the first documentation for Swift Foxes.

Key Words: Swift Fox, *Vulpes velox*, Texas, white color phase.

Although Gray Wolves (*Canis lupus*) and Red Foxes (*Vulpes vulpes*) can exhibit several color phases (Ballard and Gipson 2000; Kamler and Ballard 2002), most canid species, including Coyotes (*Canis latrans*), Gray Foxes (*Urocyon cinereoargenteus*), Kit Foxes (*Vulpes macrotis*), and Swift Foxes (*Vulpes velox*), exhibit only one color phase. Variations in eye color are rarely reported for any canid species. We document the occurrence of a white color phase and light blue eyes in the Swift Fox.

On 26 September 2000, at Rita Blanca National Grasslands (36-2° N, 102-40° W) in Dallam County, Texas, we captured and radio-collared a juvenile female Swift Fox that had a white pelage and light blue eyes (trapping was part of a research project on Swift

Fox ecology in Texas). We recaptured this individual six times and monitored her on the study site until late December when she presumably dispersed. This individual was not an albino since the eyes were light blue rather than pink, and some guard hairs on the tail, back, and muzzle were black. Photographs of the white Swift Fox are deposited in The Museum, Texas Tech University, Lubbock.

We interviewed a local trapper (with no knowledge of the white Swift Fox we captured) who stated he captured a juvenile male and an adult male Swift Fox with white pelage and light blue eyes in January 2001 on land adjacent to our study area. This man also stated that he trapped Swift Foxes in that area for approximately 20 years, but had never previously captured